

REMARKS/ARGUMENTS

This paper is submitted in response to the Office Action mailed May 18, 2006. A Request for a Two Month Extension of Time pursuant to 37 CFR 1.136(a) is submitted herewith, along with the fee prescribed by 37 CFR 1.17(a)(2). The response is therefore timely.

The undersigned attorney, on behalf of the Applicant, expresses appreciation to Examiner Bhat for the telephonic interview conducted on 7 September 2006. An Examiner's Interview Summary was mailed 13 September 2006, and the substance of the interview was accurately summarized therein. In accordance with MPEP 713.04, the Applicant's summary of the substance of the interview is set forth below.

Claims 1-45 were filed. In a telephonic interview conducted with the Examiner on 21 April 2006, Applicant was informed that restriction was required between claims 1-35, drawn to an apparatus, and claims 36-45, drawn to a process. Applicant orally elected to prosecute claims 1-35 with traverse. This election is hereby affirmed, the traverse is withdrawn, and claims 36-45 have accordingly been cancelled without prejudice to Applicant's right to re-file them in a divisional application.

In the Office Action mailed 18 May 2006, claims 1-35 were rejected under 35 U.S.C. §103(a) as unpatentable over US 5,904,907 – Shih. This rejection is respectfully traversed.

It was the Examiner's position in the Office Action that Shih discloses Applicant's invention "substantially as claimed." While it was conceded that Shih "does not teach the velocity of the liquid or gas within the reactor nor specifically teach...that the combined flow of liquid and vapor is contacted to flow through each mixing orifices (*sic.*) at no slip two phase flow conditions," it was the Examiner's position that the Shih apparatus "is capable of operating at no slip conditions or operated at the velocities recited by applicant." Thus, the Examiner's contention was that it would have been obvious "to optimize the reactor conditions based on the teachings of Shih."

In the above-mentioned telephonic interview of 7 September 2006, it was agreed that the Applicant and the Examiner have different interpretations of Shih with respect to whether it teaches or suggests "a first and a t least one second mixing orifice or passage arranged

sequentially along said flow path...such that the entire combined flow of liquid and vapor is constrained to flow through each of said mixing orifices.” The Examiner and the Applicant agreed that Shih discloses baffles, in the form of a plurality of chevrons, that create a “mixing zone” for the liquid and vapor flows. It was (and is) Applicant’s position that Shih does not teach or suggest first and second mixing orifices arranged such that substantially the entire combined flow of liquid and vapor is constrained to flow through each mixing orifice. It is on this basis that Applicant contends the present invention is patentable over Shih. It was agreed, however, that the claims would be amended to distinguish Applicant’s invention more clearly over Shih.

Accordingly, new independent claims 46 and 47 are presented, replacing claims 1 and 13, respectively. As explained below, it is respectfully submitted that claims 46 and 47 define patentably over Shih and the other art of record.

Claim 46 defines a reactor vessel mixing device, comprising, *inter alia*:

- a flow path defined between an inlet and an outlet;

- a flow dividing structure disposed in the flow path so as to divide a combined flow of vapor and liquid through the flow path into first and second two-phase flow streams of vapor and liquid; and

- at least first and second mixing orifices, the first mixing orifice disposed in the flow path upstream from the flow dividing structure, and the second mixing orifice disposed in the flow path downstream from the flow dividing structure so as to recombine the first and second flow streams, the first and second mixing orifices being arranged and configured so that substantially the entire combined flow of liquid and vapor is constrained to flow through each of the first and second mixing orifices.

Claim 46 thus defines a flow path for a combined liquid/vapor flow between an inlet and an outlet, in which a flow dividing structure is placed so as to divide the combined flow into first and second streams; wherein a first mixing orifice is located upstream of the flow dividing structure, and a second mixing orifice is located downstream from the flow dividing structure; and wherein substantially the entire combined liquid/vapor flow is constrained to flow through both mixing orifices. It is respectfully submitted that such structure is neither taught nor suggested by Shih.

Shih discloses a mixing vessel with two inlets 26, two outlets 32, and a mixing chamber having a plurality of baffles or "chevrons" 70a, 70b. Thus, even if one assumes, for sake of argument only, that the flow through each inlet is a "combined flow," and that the chevrons divide the combined flow into two or more streams, there is no mixing orifice downstream of the chevrons through which "substantially the entire combined flow of liquid and vapor is constrained to flow". (Indeed, there is no such mixing orifice upstream of the chevrons, either.) In fact, the flow downstream of the chevrons remains divided into two outlet streams through the two outlets 32. Thus, the specific structure defined in claim 46 is neither shown nor suggested by Shih.

Moreover, while the chevrons 70a, 70b in Shih provide turbulence and mixing, there is no teaching or suggestion of any mixing orifice that is configured and/or located so as to provide a "no-slip two-phase flow velocity of the combined flow in each of the...mixing orifices during at least one operational phase of the reactor [that] is sufficient for the liquid to be dispersed into the vapor and/or the vapor to be dispersed into the liquid," as defined in claim 46. Furthermore, there is nothing in Shih that teaches or suggests that the aforementioned result is a function of the relationship between the area of the mixing orifices and the flow rate of the combined flow, as defined in claim 46. In short, there is nothing in Shih that teaches or suggests the structure that achieves the intended result defined in claim 46.

Accordingly, it is respectfully submitted that claim 46 defines patentably over the cited art and should be allowed. Claims 2, 4-12, 26, 34, 48, 50, and 51 depend from claim 46 and further define the novel and non-obvious features of the invention. These claims likewise should be allowed along with claim 46.

Claim 47 defines a reactor vessel mixing device comprising, *inter alia*, "interior baffles...configured and located between the inlet and the outlet so as to define first and second mixing orifices arranged sequentially along the flow path, the first and second mixing orifices being located and configured so as to constrain substantially the entire combined flow of liquid and vapor to flow through each of the mixing orifices...." This structure is readily distinguishable from that shown in Shih. While the baffles or chevrons in Shih can be viewed as defining a plurality of mixing "orifices" between and among them, none of these

“orifices” is “located and configured so as to constrain substantially the entire combined flow of liquid and vapor” to flow through it. In Shih, only a small fraction of the total flow entering the “mixing zone” flows through the each of the “orifices” defined by the chevrons.

Furthermore, as discussed above with respect to claim 46, there is no teaching or suggestion in Shih of any mixing orifice that is configured and/or located so as to provide a “no-slip two-phase flow velocity of the combined flow in each of the...mixing orifices during at least one operational phase of the reactor [that] is sufficient for the liquid to be dispersed into the vapor and/or the vapor to be dispersed into the liquid,” as defined in claim 47. Nor is there anything in Shih that teaches or suggests that the aforementioned result is a function of the relationship between the area of the mixing orifices and the flow rate of the combined flow, as defined in claim 47. In short, there is nothing in Shih that teaches or suggests the structure that achieves the intended result defined in claim 47.

Therefore, it is respectfully submitted that claim 47 defines patentably over the art of record and should therefore be allowed. Claims 14-16, 18-25, 27-33, 35, 49, 52, and 53 depend from claim 47 and further define the novel and non-obvious features of the invention. These claims likewise should be allowed along with claim 47.

In summary, it is respectfully submitted that new independent claims 46 and 47 are allowable over the art of record, as are dependent claims 2, 4-12, 14-16, 18-35, and 48-53. Allowance of these claims is respectfully requested, and passage of the application to issue is earnestly solicited.

Should there be any further issues remaining in the application, the Examiner is respectfully requested to telephone the undersigned attorney to expedite the prosecution of the application to issue.

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Respectfully submitted,



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